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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/472,300	12/27/1999	STEVE J. SHATTIL	0886285913	8567

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EXAMINER

MOORE, JAMES K

ART UNIT	PAPER NUMBER
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2681

DATE MAILED: 04/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

09/472,300

Applicant(s)

SHATTIL, STEVE J.

Examiner

James K Moore

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 February 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) 24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 and 25-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 December 1999 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Claim 24 is withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 6.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 8-13 and 22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 8 recites the limitation "the optimization process" in line 3. There is insufficient antecedent basis for this limitation in the claim.

Claim 9 is indefinite because it depends upon itself. Claims 10-13 depend on claim 9. For the purpose of examination, the examiner has proceeded with prior art rejections of claims 9-13 based upon the assumption that claim 9 depends on claim 1.

11. Claim 22 recites the limitation "the at least one transmission parameter" in line 11. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

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4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

5. Claims 1-6, 8-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Xu et al. ("Throughput Multiplication of Wireless LANs for Multimedia Services: SMDA Protocol Design").

Regarding claims 1 and 20, Xu discloses a method of providing frequency reuse in a communication system. The method includes receiving a plurality of transmitted signals ($s_k(t)$) with a plurality of receiver elements. The receiver elements provide a plurality of received signals ($s_k(t)a_k$) having known ratios of co-channel interference. The method also includes providing the received signals with algebraically unique ratios of co-channel interference (weighting vector w_i^H). Note that $w_i^H a_j = 0$ for $j \neq i$. The

method also includes separating a desired signal ($s_i(t)$) from the received signals. See Abstract and Section 2.

Regarding claim 2, Xu discloses all of the limitations of claim 1, and also discloses that providing the received signals with the algebraically unique ratios of co-channel interference shapes the spatial gain distribution a_k of at least one of the transmitted signals. See Section 2.

Regarding claim 3, Xu discloses all of the limitations of claim 1, and also discloses that providing the received signals with the algebraically unique ratios of co-channel interference shapes the spatial gain distribution a_k of at least one of the received signals. See Section 2.

Regarding claim 4, Xu discloses all of the limitations of claim 1, and also discloses that providing the received signals with the algebraically unique ratios of co-channel interference includes beam steering. See Section 2.

Regarding claim 5, Xu discloses all of the limitations of claim 1, and also discloses that the received signals are provided with the algebraically unique ratios of co-channel interference in response to a feedback signal from a receiver. See Section 2.

Regarding claim 6, Xu discloses all of the limitations of claim 1, and also discloses that the receiver elements are spatially separated array elements. See Section 2.

Regarding claim 8, Xu discloses all of the limitations of claim 1, and the determination of the algebraically unique ratios of co-channel interference inherently comprises determining the optimal ratios of co-channel interference.

Regarding claim 9, Xu discloses all of the limitations of claim 1, and also discloses that the ratios of co-channel interference result from spatial gain distributions a_k of the received signals. See Section 2.

Regarding claim 10, Xu discloses all of the limitations of claim 9, and it is inherent that the spatial gain distribution includes at least one minima in a predetermined spatial region.

Regarding claim 11, Xu discloses all of the limitations of claim 9, and it is inherent that the spatial gain distribution includes at least one spatial region having at least one predetermined ratio of signal levels.

Regarding claim 12, Xu discloses all of the limitations of claim 9, and also discloses that the spatial gain distribution is controlled by directionality of the receivers. See Section 2.

Regarding claim 13, Xu discloses all of the limitations of claim 9, and also discloses that the spatial gain distribution is created by an overlap of at least two transmitted signals. See Section 2.

Regarding claim 14, Xu discloses all of the limitations of claim 1, and also discloses that the ratios of co-channel interference provide weights to a cancellation step that is included in separating the desired signal from the received signals. See Section 2.

Regarding claim 15, Xu discloses all of the limitations of claim 1, and it is inherent that the weights may be represented by complex values.

Regarding claim 16, Xu discloses all of the limitations of claim 1, and it is inherent that the weights include delay elements.

Regarding claim 17, Xu discloses all of the limitations of claim 1, and it is inherent that the weights are frequency-dependent and the transmission signals have diverse frequency characteristics.

Regarding claim 18, Xu discloses all of the limitations of claim 1, and it is inherent that the weights are frequency-dependent and the transmission signals have a plurality of signal frequencies.

Regarding claims 19 and 21, Xu discloses all of the limitations which are common to claims 1 and 20. Xu also discloses that the transmission signals have at least one common frequency channel. See Abstract.

6. Claim 22 is rejected under 35 U.S.C. 102(e) as being anticipated by Laasko et al. (U.S. Patent No. 5,898,740).

Regarding claim 22, Laasko discloses a method of optimizing separation of a plurality of transmitted signals received by a plurality of receiver elements coupled to a cancellation circuit. The method includes receiving a plurality of transmission signals transmitted in a common frequency channel for providing a plurality of received signals. The received signals have co-channel interference. The method also includes providing a determination of signal quality (signal-to-interference ratio) for separated signals

output by the cancellation circuit, providing feedback signals (power control signals) to transmitters (11-14) that generate the transmission signals, and adjusting transmission parameters (power levels) to provide adjustment to the co-channel interference of received signals. The adjustment of the transmission parameters is related to the values of the feedback signals. See Figures 1 and 4; col. 3, lines 15-57; and col. 5, line 42 through col. 6, line 51.

7. Claim 23 is rejected under 35 U.S.C. 102(e) as being anticipated by Martin (U.S. Patent No. 5,875,216).

Regarding claim 23, Martin discloses a method of separating received transmission signals ($u(t)$) having known ratios of co-channel interference. The method includes receiving the transmission signals with a plurality of receivers which provide a plurality of received signals having known ratios of co-channel interference, providing weights ($w_1(k)$ to $w_M(k)$) to a cancellation circuit (20,24) based on the ratios of co-channel interference, and coupling the received signals into the cancellation circuit which separates the received transmission signals. See Abstract and col. 3, lines 8-32.

8. Claim 25 is rejected under 35 U.S.C. 102(e) as being anticipated by Barratt et al. (U.S. Patent No. 5,592,490).

Regarding claim 25, Barratt discloses a signal canceller that separates transmission signals from a plurality of interfering transmission signals received by a receiver (16). The signal canceller includes a frequency filter coupled to the receiver

which receives a plurality of the received transmission signals. Each of the received signals has an algebraically unique combination of the transmission signals and each of the transmission signals has distributed frequency characteristics. The frequency filter separates each of the received signals into a plurality of received-signal frequency components. The signal canceller also includes a plurality of weighting elements (22) coupled to the frequency filter. The weighting elements provide a weight to each of the received-signal frequency components to provide a plurality of weighted received-signal frequency components. The signal canceller also includes a signal combiner (21) which sums the weighted received-signal frequency components to separate the received transmission signals. See Abstract; Figures 1 and 3; col. 3, lines 38-59; col. 6, line 55 through col. 7, line 17; and col. 8, lines 9-35.

9. Claims 26-28 are rejected under 35 U.S.C. 102(b) as being anticipated by Roy, III et al. (U.S. Patent No. 5,515,378).

Regarding claim 26, Roy discloses a signal canceller (Spatial Demultiplexer 120) which separates one or more transmission signals (s_1, s_2, s_3) from a plurality of interfering transmissions signals received by a receiver. The signal canceller includes a plurality of weighting elements coupled to the receiver which receive a plurality of receive signals ($x_r(t)$ - 112, 114, 116) from the receiver. Each of the receive signals has an algebraically unique combination of the transmission signals. The weighting elements provide weights ($w_r(\theta_k)$) to each of the receive signals to provide a plurality of weighted receive signals. The signal canceller also includes a signal combiner which

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sums the weighted receive signal to separate the interfering transmission signals. See Figures 4 and 7; col. 13, line 25 through col. 14, line 10; col. 20, lines 5-20; col. 21, lines 44-57; and col. 24, lines 1-9.

Regarding claim 27, Roy discloses a receiver which separates a plurality of received transmission signals (s_1, s_2, s_3). The receiver includes a plurality of receiver elements (multichannel receivers 102, 104, 106) which sample the transmission signals. The receiver elements are responsive to the transmission signals for generating a plurality of receive signals (112, 114, 116), where each of the receive signals includes an algebraically unique combination of the transmissions signals. The receiver also includes a canceller (SDMAP/Spatial Demultiplexer 120) coupled to the receiver elements which separates the received transmission signals. See Figures 4 and 7; col. 13, line 25 through col. 14, line 10; col. 20, lines 5-20; and col. 21, lines 44-57.

Regarding claim 28, Roy discloses all of the limitations of claim 27, and also discloses that the plurality of receiver element is an antenna array that includes a plurality of antenna-array beam processors, and that the receive signals are output from each of the processors. See Figure 7 and col. 13, lines 44-62.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Xu et al. in view of Dogan et al. (U.S. Patent No. 6,018,317).

Regarding claim 7, Xu discloses all of the limitations of claim 1, but does not disclose that the receiver elements are polarization elements and the co-channel interference includes cross polarization. However, Dogan teaches that antenna elements may be polarized in order to separate independent signals which are transmitted on the same carrier frequency but different polarizations. See col. 65, lines 16-52. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Xu with Dogan, such that the transmitted signals are cross-polarized and the receiver elements are polarization elements, in order to improve frequency reuse and signal separation.

12. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Roy, III et al. in view of Dogan et al.

Regarding claim 29, Roy discloses a receiver which receives a plurality of algebraically unique proportions of a plurality of transmission signals (s_1, s_2, s_3) to separate the received transmission signals. The receiver includes a plurality of receiver elements (multichannel receivers 102, 104, 106). Each of the receiver elements has a different responsiveness to the transmission signals for generating a plurality of receive signals (112, 114, 116), where each of the receive signals includes an algebraically unique combination of the transmission signals. The receiver also includes a canceller

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(SDMAP/Spatial Demultiplexer 120) coupled to the receiver elements which separates the received transmission signals. See Figures 4 and 7; col. 13, line 25 through col. 14, line 10; col. 20, lines 5-20; and col. 21, lines 44-57. Roy does not disclose that the transmission signals are differently polarized, or that the receiver elements are polarized. However, Dogan teaches that antenna elements may be polarized in order to separate independent signals which are transmitted on the same carrier frequency but different polarizations. See col. 65, lines 16-52. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Roy with Dogan, such that the transmitted signals are differently polarized and the receiver elements are polarization elements, in order to improve frequency re-use and signal separation.

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ken Moore, whose telephone number is (703) 308-6042. The examiner can normally be reached on Monday-Friday from 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dwayne Bost, can be reached at (703) 305-4778.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

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(703) 872-9314 (for Technology Center 2600 only)

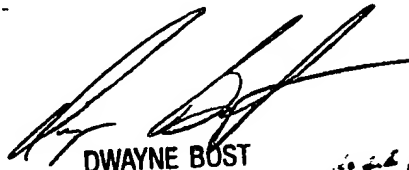
Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

Ken Moore

4/17/03

JKM


DWAYNE BOST
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600